



Short-range NWP for direct normal irradiance by utilizing Meteosat Second Generation data

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In this work we address short-range forecasts of direct normal irradiance (DNI) for application in concentrating solar power systems as part of the European project DNICast (DNI Nowcasting methods for optimized operation of concentrating solar technologies). While aerosols also play an important role, we focus on the impact of clouds for the forecasted irradiance. The aimed forecast window in this study ranges from 0 up to 24 hours. Observational information on clouds is provided operationally by satellites, especially from Meteosat Second Generation (MSG). In order to utilize this information for longer forecasts than 2 hours, traditionally addressed by conventional nowcasting techniques, we assimilate MSG into the meso-scale NWP system HARMONIE. To this end, we employ different data assimilation techniques such as the assimilation of MSG SEVIRI radiances, cloud initialization with MSG cloud products and 4-dimensional variational 4DVar data assimilation and examine their impact on the skill of the short-range DNI forecasting.

For DNICast, the HARMONIE system is setup with a domain over the Western Mediterranean with a horizontal spacing of 2.5 km and run for April 2013. The domain contains the Plataforma Solar de Almería (PSA) in Southern Spain and the Carpentras station of the Baseline Surface Radiation Network (BSRN) providing surface irradiance observations that are used to validate the NWP forecasts. Furthermore, the standard meteorological observational network is used for forecast verification. A clear improvement in the forecasts for relative humidity and cloud cover can be seen due to the additional assimilation of SEVIRI radiances. The cloud initialization leads to modelled clouds with favorable verification against MSG products, however the forecasted relative humidity and DNI deteriorates. More research into this issue is needed. The 4DVar experiments display promising results.